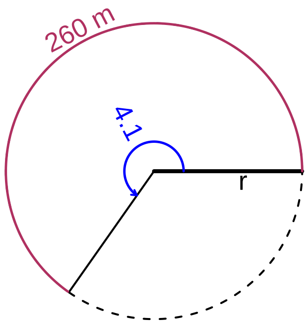
Name: Date:

Trig Final (Solution v0)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 260 meters. The angle measure is 4.1 radians. How long is the radius in meters?

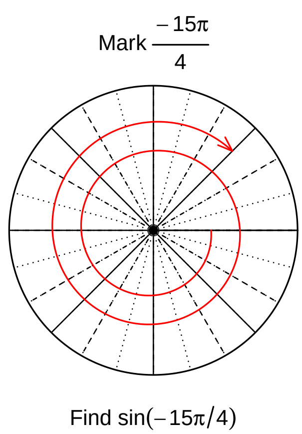


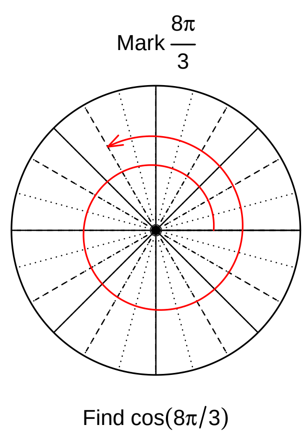
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$r = 63.41$ meters.

Question 2

Consider angles $\frac{-15\pi}{4}$ and $\frac{8\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-15\pi}{4}\right)$ and $\cos\left(\frac{8\pi}{3}\right)$ by using a unit circle (provided separately).





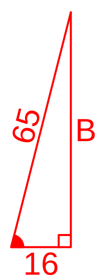
$\sin(-15\pi/4) = \frac{\sqrt{2}}{2}$

$\cos(8\pi/3) = \frac{-1}{2}$

Question 3

If $\cos(\theta) = \frac{-16}{65}$, and θ is in quadrant II, determine an exact value for $\sin(\theta)$.

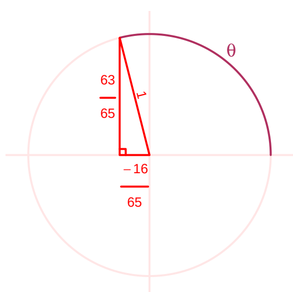
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$16^2 + B^2 = 65^2$$
$$B = \sqrt{65^2 - 16^2}$$
$$B = 63$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\sin(\theta) = \frac{63}{65}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 2.5 meters, a midline at $y = -5.79$ meters, and a frequency of 3.66 Hz. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -2.5\cos(2\pi 3.66t) - 5.79$$

or

$$y = -2.5\cos(7.32\pi t) - 5.79$$

or

$$y = -2.5\cos(23t) - 5.79$$

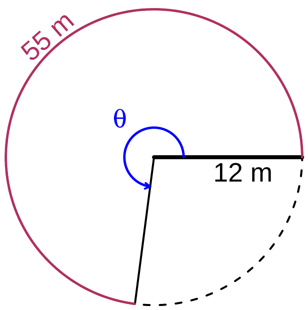
Name: Date:

Trig Final (Solution v1)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 55 meters. The radius is 12 meters. What is the angle measure in radians?

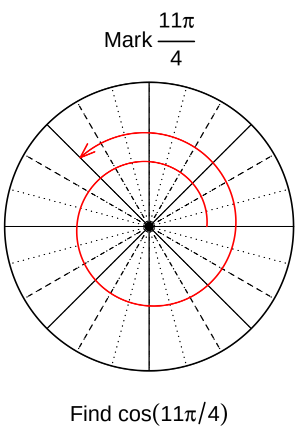


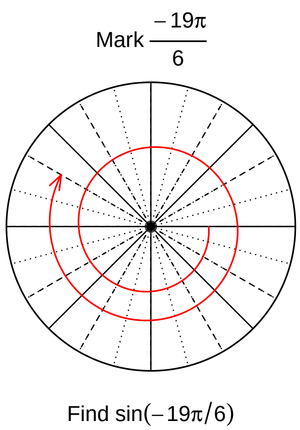
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$\theta = 4.583$ radians.

Question 2

Consider angles $\frac{11\pi}{4}$ and $\frac{-19\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{11\pi}{4}\right)$ and $\sin\left(\frac{-19\pi}{6}\right)$ by using a unit circle (provided separately).





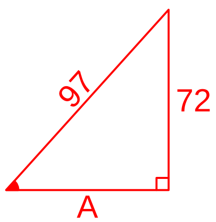
$\cos(11\pi/4) = \frac{-\sqrt{2}}{2}$

$\sin(-19\pi/6) = \frac{1}{2}$

Question 3

If $\sin(\theta) = \frac{-72}{97}$, and θ is in quadrant IV, determine an exact value for $\tan(\theta)$.

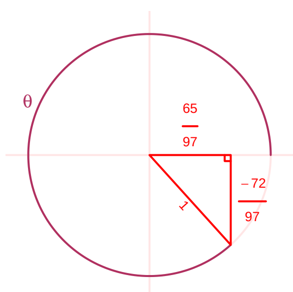
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 72^2 = 97^2$$
$$A = \sqrt{97^2 - 72^2}$$
$$A = 65$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\tan(\theta) = \frac{\frac{-72}{97}}{\frac{65}{97}} = \frac{-72}{65}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 3.28 meters, a midline at $y = 6.07$ meters, and a frequency of 8.42 Hz. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 3.28\cos(2\pi 8.42t) + 6.07$$

or

$$y = 3.28\cos(16.84\pi t) + 6.07$$

or

$$y = 3.28\cos(52.9t) + 6.07$$

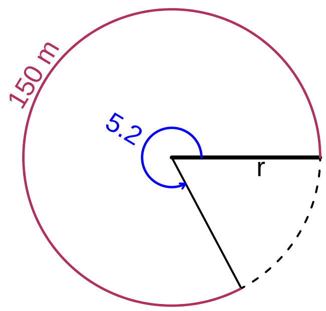
Name: Date:

Trig Final (Solution v2)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 150 meters. The angle measure is 5.2 radians. How long is the radius in meters?



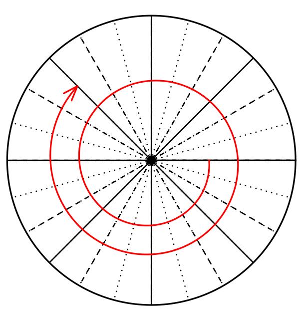
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$r = 28.85$ meters.

Question 2

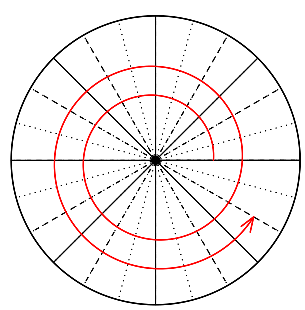
Consider angles $\frac{-13\pi}{4}$ and $\frac{23\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-13\pi}{4}\right)$ and $\sin\left(\frac{23\pi}{6}\right)$ by using a unit circle (provided separately).

Mark $\frac{-13\pi}{4}$



Find $\cos(-13\pi/4)$

Mark $\frac{23\pi}{6}$



Find $\sin(23\pi/6)$

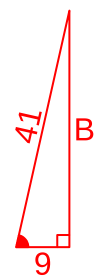
$\cos(-13\pi/4) = \frac{-\sqrt{2}}{2}$

$\sin(23\pi/6) = \frac{-1}{2}$

Question 3

If $\cos(\theta) = \frac{-9}{41}$, and θ is in quadrant II, determine an exact value for $\sin(\theta)$.

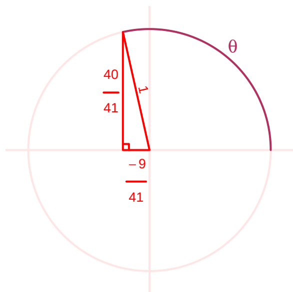
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$9^2 + B^2 = 41^2$$
$$B = \sqrt{41^2 - 9^2}$$
$$B = 40$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\sin(\theta) = \frac{40}{41}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 3.51 meters, a midline at $y = -2.23$ meters, and a frequency of 7.4 Hz. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -3.51\sin(2\pi 7.4t) - 2.23$$

or

$$y = -3.51\sin(14.8\pi t) - 2.23$$

or

$$y = -3.51\sin(46.5t) - 2.23$$

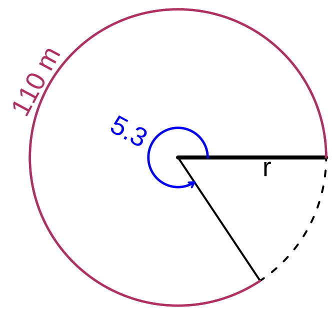
Name: Date:

Trig Final (Solution v3)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 5.3 radians. The arc length is 110 meters. How long is the radius in meters?

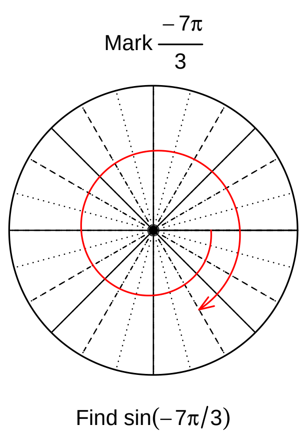


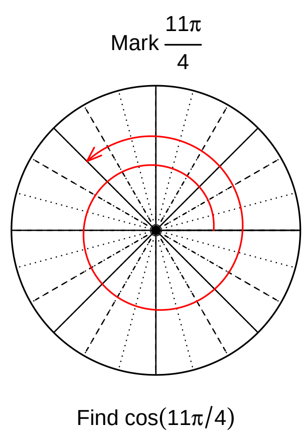
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$r = 20.75$ meters.

Question 2

Consider angles $\frac{-7\pi}{3}$ and $\frac{11\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-7\pi}{3}\right)$ and $\cos\left(\frac{11\pi}{4}\right)$ by using a unit circle (provided separately).





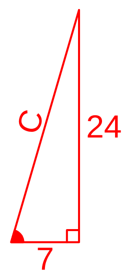
$\sin(-7\pi/3) = \frac{-\sqrt{3}}{2}$

$\cos(11\pi/4) = \frac{-\sqrt{2}}{2}$

Question 3

If $\tan(\theta) = \frac{-24}{7}$, and θ is in quadrant IV, determine an exact value for $\cos(\theta)$.

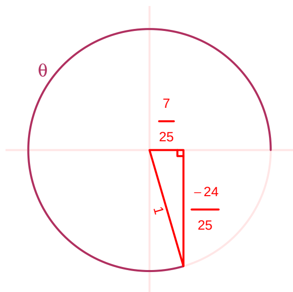
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$7^2 + 24^2 = C^2$$
$$C = \sqrt{7^2 + 24^2}$$
$$C = 25$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\cos(\theta) = \frac{7}{25}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 3.57 Hz, an amplitude of 2.04 meters, and a midline at $y = 7.44$ meters. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -2.04\cos(2\pi 3.57t) + 7.44$$

or

$$y = -2.04\cos(7.14\pi t) + 7.44$$

or

$$y = -2.04\cos(22.43t) + 7.44$$

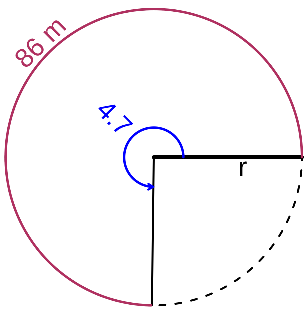
Name: Date:

Trig Final (Solution v4)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 86 meters. The angle measure is 4.7 radians. How long is the radius in meters?



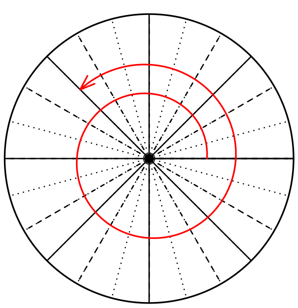
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$r = 18.3$ meters.

Question 2

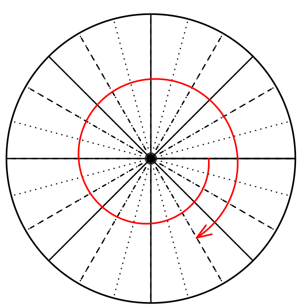
Consider angles $\frac{11\pi}{4}$ and $\frac{-7\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{11\pi}{4}\right)$ and $\sin\left(\frac{-7\pi}{3}\right)$ by using a unit circle (provided separately).

Mark $\frac{11\pi}{4}$



Find $\cos(11\pi/4)$

Mark $\frac{-7\pi}{3}$



Find $\sin(-7\pi/3)$

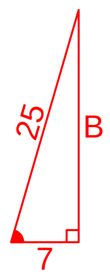
$\cos(11\pi/4) = \frac{-\sqrt{2}}{2}$

$\sin(-7\pi/3) = \frac{-\sqrt{3}}{2}$

Question 3

If $\cos(\theta) = \frac{-7}{25}$, and θ is in quadrant II, determine an exact value for $\sin(\theta)$.

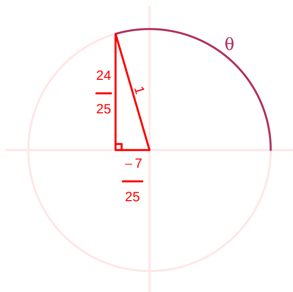
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$7^2 + B^2 = 25^2$$
$$B = \sqrt{25^2 - 7^2}$$
$$B = 24$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\sin(\theta) = \frac{24}{25}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 3.35 meters, a frequency of 2.22 Hz, and a midline at $y = -8.66$ meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 3.35 \sin(2\pi 2.22t) - 8.66$$

or

$$y = 3.35 \sin(4.44\pi t) - 8.66$$

or

$$y = 3.35 \sin(13.95t) - 8.66$$

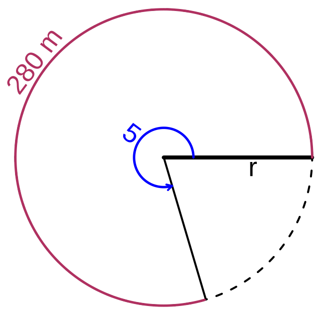
Name: Date:

Trig Final (Solution v5)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 280 meters. The angle measure is 5 radians. How long is the radius in meters?

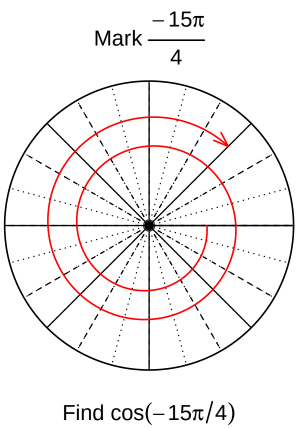


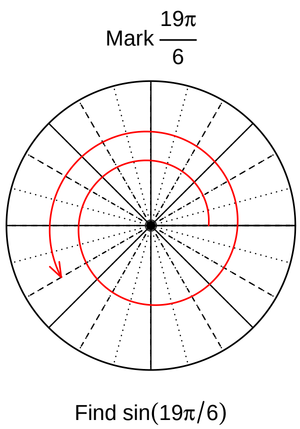
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$r = 56$ meters.

Question 2

Consider angles $\frac{-15\pi}{4}$ and $\frac{19\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-15\pi}{4}\right)$ and $\sin\left(\frac{19\pi}{6}\right)$ by using a unit circle (provided separately).





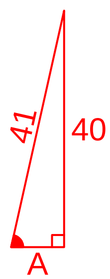
$\cos(-15\pi/4) = \frac{\sqrt{2}}{2}$

$\sin(19\pi/6) = \frac{-1}{2}$

Question 3

If $\sin(\theta) = \frac{-40}{41}$, and θ is in quadrant IV, determine an exact value for $\cos(\theta)$.

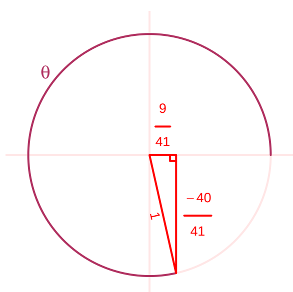
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 40^2 = 41^2$$
$$A = \sqrt{41^2 - 40^2}$$
$$A = 9$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\cos(\theta) = \frac{9}{41}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 6.21 Hz, an amplitude of 4.58 meters, and a midline at $y = -7.63$ meters. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -4.58\cos(2\pi 6.21t) - 7.63$$

or

$$y = -4.58\cos(12.42\pi t) - 7.63$$

or

$$y = -4.58\cos(39.02t) - 7.63$$

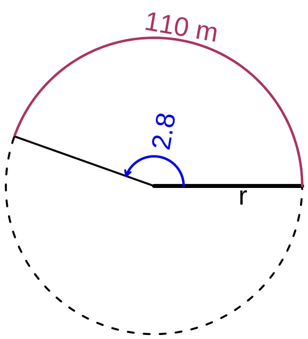
Name: Date:

Trig Final (Solution v6)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 110 meters. The angle measure is 2.8 radians. How long is the radius in meters?

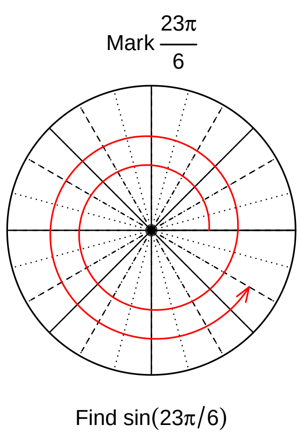


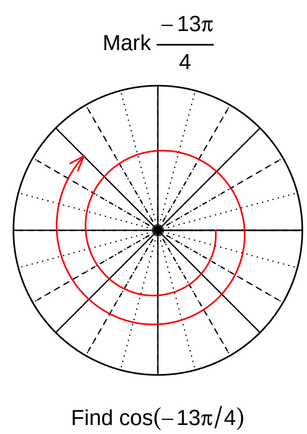
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$r = 39.29$ meters.

Question 2

Consider angles $\frac{23\pi}{6}$ and $\frac{-13\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{23\pi}{6}\right)$ and $\cos\left(\frac{-13\pi}{4}\right)$ by using a unit circle (provided separately).





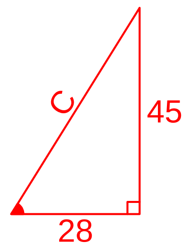
$\sin(23\pi/6) = \frac{-1}{2}$

$\cos(-13\pi/4) = \frac{-\sqrt{2}}{2}$

Question 3

If $\tan(\theta) = \frac{-45}{28}$, and θ is in quadrant IV, determine an exact value for $\cos(\theta)$.

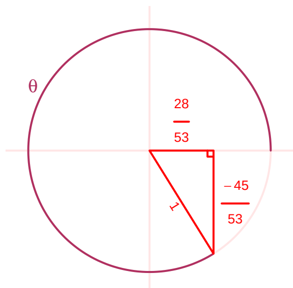
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$28^2 + 45^2 = C^2$$
$$C = \sqrt{28^2 + 45^2}$$
$$C = 53$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\cos(\theta) = \frac{28}{53}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 6.85 Hz, an amplitude of 8.76 meters, and a midline at $y = 4.12$ meters. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -8.76\sin(2\pi 6.85t) + 4.12$$

or

$$y = -8.76\sin(13.7\pi t) + 4.12$$

or

$$y = -8.76\sin(43.04t) + 4.12$$

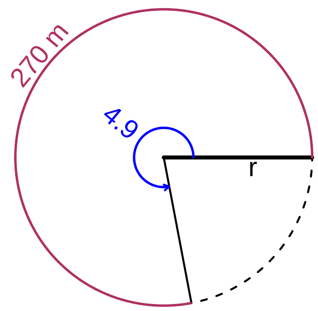
Name: Date:

Trig Final (Solution v7)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 270 meters. The angle measure is 4.9 radians. How long is the radius in meters?

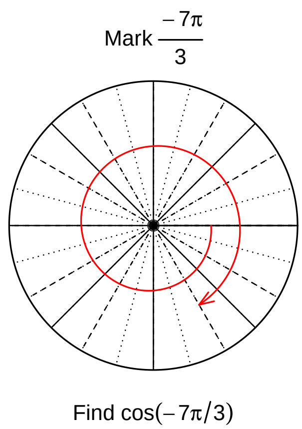


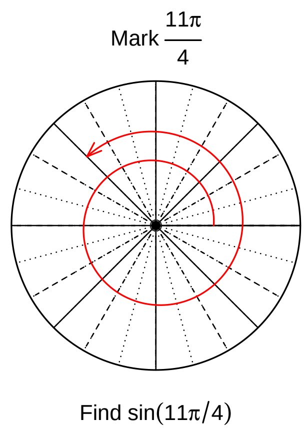
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$r = 55.1$ meters.

Question 2

Consider angles $\frac{-7\pi}{3}$ and $\frac{11\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-7\pi}{3}\right)$ and $\sin\left(\frac{11\pi}{4}\right)$ by using a unit circle (provided separately).





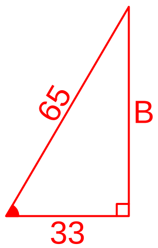
$\cos(-7\pi/3) = \frac{1}{2}$

$\sin(11\pi/4) = \frac{\sqrt{2}}{2}$

Question 3

If $\cos(\theta) = \frac{33}{65}$, and θ is in quadrant IV, determine an exact value for $\sin(\theta)$.

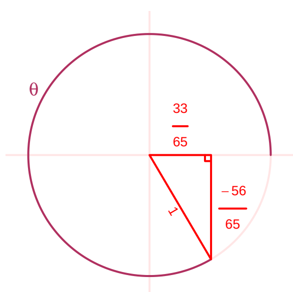
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$33^2 + B^2 = 65^2$$
$$B = \sqrt{65^2 - 33^2}$$
$$B = 56$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\sin(\theta) = \frac{-56}{65}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 8.89 Hz, a midline at $y = -7$ meters, and an amplitude of 3.66 meters. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -3.66\cos(2\pi 8.89t) - 7$$

or

$$y = -3.66\cos(17.78\pi t) - 7$$

or

$$y = -3.66\cos(55.86t) - 7$$

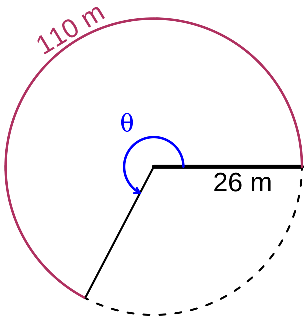
Name: Date:

Trig Final (Solution v8)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 110 meters. The radius is 26 meters. What is the angle measure in radians?

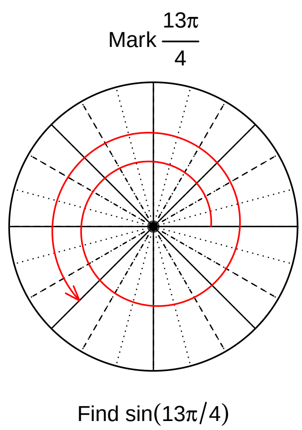


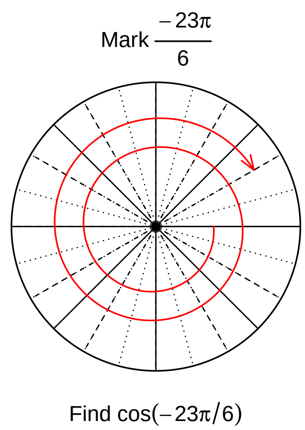
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$\theta = 4.231$ radians.

Question 2

Consider angles $\frac{13\pi}{4}$ and $\frac{-23\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{13\pi}{4}\right)$ and $\cos\left(\frac{-23\pi}{6}\right)$ by using a unit circle (provided separately).





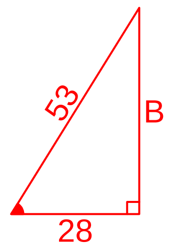
$\sin(13\pi/4) = \frac{-\sqrt{2}}{2}$

$\cos(-23\pi/6) = \frac{\sqrt{3}}{2}$

Question 3

If $\cos(\theta) = \frac{-28}{53}$, and θ is in quadrant III, determine an exact value for $\sin(\theta)$.

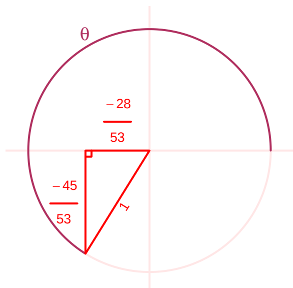
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$28^2 + B^2 = 53^2$$
$$B = \sqrt{53^2 - 28^2}$$
$$B = 45$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\sin(\theta) = \frac{-45}{53}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = 4.97$ meters, an amplitude of 6.29 meters, and a frequency of 8.56 Hz. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 6.29\cos(2\pi 8.56t) + 4.97$$

or

$$y = 6.29\cos(17.12\pi t) + 4.97$$

or

$$y = 6.29\cos(53.78t) + 4.97$$

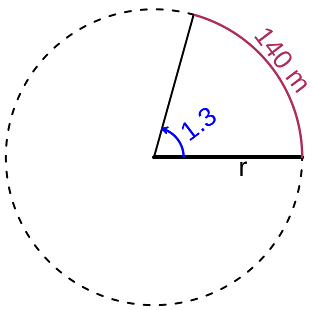
Name: Date:

Trig Final (Solution v9)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 1.3 radians. The arc length is 140 meters. How long is the radius in meters?

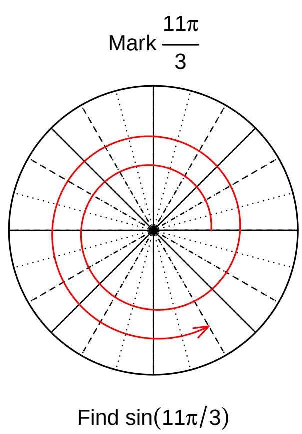


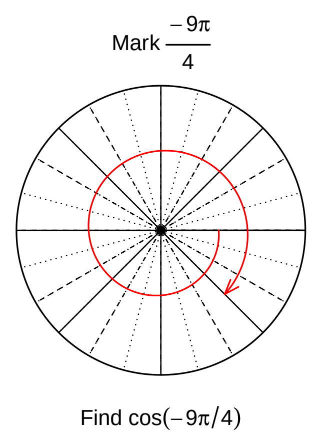
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$r = 107.7$ meters.

Question 2

Consider angles $\frac{11\pi}{3}$ and $\frac{-9\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{11\pi}{3}\right)$ and $\cos\left(\frac{-9\pi}{4}\right)$ by using a unit circle (provided separately).





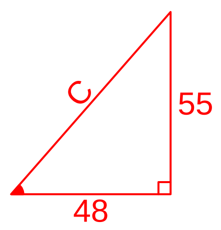
$\sin(11\pi/3) = \frac{-\sqrt{3}}{2}$

$\cos(-9\pi/4) = \frac{\sqrt{2}}{2}$

Question 3

If $\tan(\theta) = \frac{55}{48}$, and θ is in quadrant III, determine an exact value for $\sin(\theta)$.

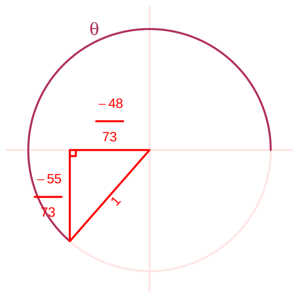
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$48^2 + 55^2 = C^2$$
$$C = \sqrt{48^2 + 55^2}$$
$$C = 73$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\sin(\theta) = \frac{-55}{73}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 3.02 Hz, a midline at $y = -7.23$ meters, and an amplitude of 5.24 meters. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 5.24\cos(2\pi 3.02t) - 7.23$$

or

$$y = 5.24\cos(6.04\pi t) - 7.23$$

or

$$y = 5.24\cos(18.98t) - 7.23$$